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JSPS UK Japan Symposium on Highspeed Rail Program

21 September 2018

**Lecture Theatre 2, Gisbert Kapp Building (G8), University of Birmingham
(52 Pritchatts Road, Edgbaston B152TT)**

Sustainability and Low-Carbon Challenges of Highspeed Rail Systems

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Abstract.

Integration of transportation and transit systems into real-world urban infrastructure systems requires extensive and genuine collaboration between scientists, engineers, policy makers, politicians and society. The goal of this symposium is to provide an interface among the engineering, scientific and general communities to foster applied research contributions from the critical steps of highspeed railway sciences to the first steps of engineering and the adoption of engineered systems to meet the needs of individuals, societies, regions, industries and countries. The topic of this symposium is very timely and original, especially when the U.K. currently and heavily invests in the highspeed rails (> £50 billions). The knowledge of life cycle and sustainability is extremely crucial for design, construction, maintenance and operations of the highspeed rails acting as the system of system.

The key objectives of this symposium are

- Provide formal and informal arenas to build long-lasting relationship between Japanese experts and the U.K. academic and industry.
- Enable knowledge transfer and share experience on highspeed rail systems, especially on the theme of life cycle management and sustainability.

- Highlight Birmingham as a world-class hub for high speed rails technology (Birmingham is home of National College for High Speed Rail, High Speed Two Ltd., British Alliance Rail Suppliers, and European-largest Birmingham Centre for Railway Research and Education).

The symposium addressed one of the most pressing issues in the U.K. High speed rail systems make significant difference to the public and provide positive contribution towards the environmental, social and economic sustainability of the communities they serve. They exist to provide social and economic connections, and people quickly take up the opportunities offered by increased mobility. Globally, high speed rails have proven to be the essential catalyst for regional growth and enhanced the quality of everyday life. This symposium had thus presented a great opportunity for the UK industry to access to extensive expertise from the pioneers in highspeed rails.

The presentation highlights collaborative research for improving sustainability and carbon footprint in transportation and transit systems in urban environments^[1-12]. The collaborative researches are aligned with United Nation's Sustainable Development Goals. With proven research insights and open data sciences, the presentation reveals that 6D BIM can be used to enhance sustainability in railway industry.

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References

1. Kaewunruen, S.; Sussman, JM; Einstein, HH; Strategic framework to achieve carbon-efficient construction and maintenance of railway infrastructure systems, *Frontiers in Environmental Science*, **2015**, 3, 6.
2. Kaewunruen, S.; Remennikov, A.M. Current state of practice in railway track vibration isolation: an Australian overview, *Australian Journal of Civil Engineering* **2016**, 14 (1), 63-71.
3. Tuler, M. V.; Kaewunruen, S. Life cycle analysis of mitigation methodologies for railway rolling noise and groundbourne vibration. *Journal of Environmental Management* **2017**, Volume 191, page 75-82.
4. Setsobhonkul, S.; Kaewunruen, S.; Sussman, J.M. Lifecycle Assessments of Railway Bridge Transitions Exposed to Extreme Climate Events. *Frontiers in Built Environment* **2017**, 35.
5. Tavares de Freitas, R.; Kaewunruen, S. Life Cycle Cost Evaluation of Noise and Vibration Control Methods at Urban Railway Turnouts. *Environments* **2016**, 3(4), 34.
6. Kaewunruen, S. Systems thinking approach for rail freight noise mitigation. *Acoustics Australia* **2016**, 44 (1), 193-194.
7. Rungskulroch, P.; Dindar, S.; Kaewunruen, S. Life cycle assessment of ground borne vibration mitigation strategies using subgrade stiffening, soft-filled barriers and open trenches. . *Inter-noise 2018* **2018**.
8. Kaewunruen, S.; Rungskulroch, P.; Jennings, D.V.; A through-life evaluation of end-of-life rolling stocks considering asset recycling, energy recovering, and financial benefit. . *Journal of Cleaner Production*, **2019**, 212, 1008-1024.
9. Kaewunruen, S.; Remennikov, A.M.; Experimental and numerical studies of railway prestressed concrete sleepers under static and impact loads, *Journal of Civil Computing* **2007**, 3, 25-28.

10. Kaewunruen, S.; Martin, V.; Life cycle assessment of railway ground-borne noise and vibration mitigation methods using geosynthetics, metamaterials and ground improvement, *Sustainability*, **2018**, 10 (10), 3753.
11. Sa'adin, SLB.; Kaewunruen, S.; Jaroszweski, D. Operational readiness for climate change of Malaysia high-speed rail, *Proc. Inst. Civ. Eng. Transp* **2016**, 169 (5), 308-320.
12. Kaewunruen, S.; Joseph, M.; Sussman, A.M. Grand challenges in transportation and transit systems. *Front. Built Environ.* **2016**, 2, 4.